SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babes-Bolyai University
1.2 Faculty	Mathematics and Computer Science
1.3 Department	Mathematics
1.4 Field of study	Mathematics
1.5 Study cycle	Bachelor
1.6 Study programme / Qualification	Mathematics and Computer Science

2. Information regarding the discipline

2.1 Name of the discipline		Astronomy					
2.2 Course coordinator		Conf. Dr. Cristina Blaga					
2.3 Seminar coordinator		Conf. Dr. Cristina Blaga					
2.4. Year of study	3	2.5 Semester	5	2.6. Type of evaluation	E	2.7 Type of discipline	compulsory

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	1/1
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar/laboratory	14/14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					40
Additional documentation (in libraries, on electronic platforms, field documentation)					24
Preparation for seminars/labs, homework, papers, portfolios and essays					20
Tutorship					4
Evaluations					4
Other activities:					2

3.7 Total individual study hours	94
3.8 Total hours per semester	150
3.9 Number of ECTS credits	6

4. Prerequisites (if necessary)

4.1. curriculum	•
4.2. competencies	•

5. Conditions (if necessary)

5.1. for the course	•
5.2. for the seminar /lab activities	• Acces to the astronomical instruments from the Astronomical Observatory of the BBU.

6. Specific competencies acquired

Professional competencies	C1.1 The ability to identify concepts, theories and use of specific description language C2.1 The ability to identify basic concepts used in the description of specific phenomena and processes C4.5 The ability to produce a mathematical model for a certain problem.
Transversal competencies	CT1. Applying rigorous and efficient work rules, displaying a responsible attitude towards the scientific and educational and creative order to maximize their potential in specific situations with respect to the basic principles and norms of professional ethics

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• Acquiring theoretical and practical knowledge necessary for understanding the principles and methods of astronomy.
7.2 Specific objective of the discipline	• Introduction of basic notions about spherical astronomy (celestial sphere, positions of celestial bodies on the celestial sphere, real and apparent motion of celestial bodies), solar system and stellar properties deduced from observations. • Assimilating this knowledge allows understanding of phenomena observed in the sky, such as sunrise and sunset of celestial bodies, solar and Moon eclipses, their visibility from a given place and other astronomical phenomena.

8. Content

8.1 Course	Teaching methods	Remarks
1. The subject and branches of Astronomy. Spherical Astronomy. Celestial coordinates: horizontal, equatorial, ecliptic and galactic system.	The lecture, description, exemplification using multimedia	
2. Precession and nutation. Changing the equatorial coordinates due to precession and nutation. Sidereal time, true solar time, average solar time, equation of time.	The lecture, description, exemplification using multimedia	
3. Transformation of sidereal time in mean solar time and vice-versa. Time and longitude. Year (tropic, calendar, sidereal and anomalistic). Precise measurement of time.	The lecture, description, exemplification using multimedia	
4. Fundamental astronomy. Determining absolute and relative position of a star. Fundamental star catalogs. Phenomena that change the position of heavenly bodies in the sky: astronomical refraction.	The lecture, description, exemplification using multimedia	
5. The aberration of light. Parallax, parsec distance measurement unit used in astronomy. Reducing observations on the positions of the	The lecture, description, exemplification using	

stars.	multimedia	
6. General description of the solar system. Two-body problem. Kepler's Laws. The orbits of the planets. Earth's orbit. Astronomical seasons.	The lecture, description, exemplification using multimedia	
7. The orbits of the Earth artificial satellites and cosmic rockets. Earth-Moon system. Movement around the Earth. Phases of the Moon. Moon's rotation on its axis.	The lecture, description, exemplification using multimedia	
8. Solar and Moon eclipses. Physical data about planets. Energy balance and surface temperature planets.	The lecture, description, exemplification using multimedia	
9. Chemical composition and stability of planetary atmospheres. The interior of planets. Roche limit and planetary rings.	The lecture, description, exemplification using multimedia	
10. The landforms observed on the surface of terrestrial planets. Large satellites of the giant planets.	The lecture, description, exemplification using multimedia	
11. Dwarf planets (Ceres and plutoids).	The lecture, description, exemplification using multimedia	
12. Asteroids (motion, physical properties)	The lecture, description, exemplification using multimedia	
13. Comets (motion and physical properties). Condition storm, meteors and meteorites	The lecture, description, exemplification using multimedia	
14. Cosmogony. Theories on solar system formation.	The lecture, description, exemplification using multimedia	

Bibliography

1. BIRNEY S.D.: Observational Astronomy, Cambridge University Press, 1991.
2. LENA P., LEBRUN F., MIGNARD F.: Observational Astrophysics, Springer, 1996.
3. POP V., BLAGA C.: Astronomie observationala, Editura Risoprint, Cluj-Napoca, 2005.
4. STERKEN C., MANFROID J.: Astronomical Photometry, Kluwer Academic Publishers, 1992.
5. URECHE V.: Universul, Astrofizica, vol. II, Editura Dacia, Cluj-Napoca, 1985.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Seminar (2 hours) Spherical trigonometry. Gauss formulae	Description, explanation, conversation.	
2. Laboratory (2 hours) Boreal sky map. The distribution of stars in the constellations and their recognition by using alignments. The first astronomical observations.	Description, explanation, conversation, individual study and / or team.	
3. Seminar (2 hours) Celestial coordinates transformations.	Description, explanation, conversation	

4. Laboratory (2 hours) Julian date corresponding to a given calendar date. Calculate the number of days in a given period with the aid of julian date.	Description, explanation, conversation, individual study and / or team.	
5. Seminar (2 hours) Rising and setting of stars.	Description, explanation, conversation	
6. Laboratory (2 hours) Refracting and reflecting telescopes. Astronomical observation through an astronomical instrument (different appearance of planets, stars and diffuse objects through the instrument).	Description, explanation, conversation, individual study and / or team.	
7. Seminar (2 hours) Time. Sidereal and mean solar time.	Description, explanation, conversation	
8. Laboratory (2 hours) Observing the Moon through a telescope.	Description, explanation, conversation, individual study and / or team.	
9. Seminar (2 hours) Motion in the solar system. Kepler's Laws. (I)	Description, explanation, conversation	
10. Laboratory (2 hours) Astronomical Software (Astronomical Laboratory (alw) and Skymaps)	Description, explanation, conversation, individual study and / or team.	
11. Seminar (2 hours) Motion in the solar system. Kepler's Laws. (II)	Description, explanation, conversation	
12. Laboratory (2 hours) Solar declination through a simple astronomical observation.	Description, explanation, conversation, individual study and / or team.	
13. Seminar (2 hours) Small bodies in the solar system.	Description, explanation, conversation	
14. Laboratory (2 hours) A plan for astronomical observations for a given calendar date. The plan must contain information about Sun (set and rise), twilight, visibility of Moon and planets, constellations at 20 UT gathered using a sky map, a celestial mapping program or internet sources.	Description, explanation, conversation, individual study and / or team.	

Bibliography

1. CUREA, I.: Atlas stelar descriptiv, Tipografia Universitatii Timisoara, 1970.
2. KARTUNEN, H., KROGER, P., OJA, H., POUTANEN, M., DONNER, K., J., - Fundamental Astronomy, Springer, Berlin, Heidelberg, 1994.
3. PAL A., POP V., URECHE V.: Astronomie, Culegere de probleme, Presa Universitara clujeana, Cluj-Napoca, 1998.
4. POP V., POP D.: Trigonometrie plana si trigonometrie sferica, Presa Universitara clujeana, Cluj-Napoca, 2003.

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- The notions acquired in the course enables graduates to propose astronomy as a subject in the curriculum according to the school, student circles to organize and / or participate in the preparation of students wishing to participate in school competitions of Astronomy.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Knowledge of the concepts introduced and their use in solving problems	Written examination (theory and problems)	3/5
10.5 Seminar/lab activities	The application of concepts learned in theoretical or practical problem	Continuous evaluation of student participation in teaching activities	2/5
10.6 Minimum performance standards			
➢ The students must solve correctly and in due time the homework. At the examination they must show that they understood the concepts introduced and can work with them.			

Date	Signature of course coordinator	Signature of seminar coordinator
28th of April 2021	Conf. Dr. Cristina Blaga	Conf. Dr. Cristina Blaga

Date of approval ..... Signature of the head of department

Prof. Dr. Octavian Agratini